

CLAIMS:

1. A laser modulating and driving device comprising:
  - 5       a modulation signal generating unit configured to generate a laser modulation signal consisting of a pair of small swing differential signals based on pixel data; and
  - 10       a driving unit configured to drive a laser according to the laser modulation signal supplied from the modulation signal generating unit.
- 15       2. The laser modulating and driving device of claim 1, wherein the modulation signal generating unit has a modulation circuit configured to produce a modulation signal, and a small swing differential  
20       signal output circuit configured to convert the modulation signal to said pair of small swing differential signals, and  
25       the driving unit has a small swing differential signal input circuit for receiving said pair of small swing differential signals.

5     3. The laser modulating and driving device of claim 2,  
wherein the small swing differential signal output  
circuit includes:

          a non-inverted and inverted signal generating  
circuit configured to produce a non-inverted signal  
10    having the same phase as the modulation signal and an  
inverted signal with the phase shifted by 180 degrees  
from the modulation signal; and

          a small swing output circuit configured to reduce  
swings of the non-inverted signal and the inverted  
15    signal to output said pair of small swing  
differential signals as the laser modulation signal.

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4. The laser modulating and driving device of claim 3,  
wherein the small swing output circuit is formed as  
current mode logic (CML) or emitter coupled logic  
(ECL) .

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5. The laser modulating and driving device of claim 4,  
5 wherein a reference potential of the CML or ECL is a  
supply voltage VCC of the modulation signal  
generating unit.

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6. The laser modulating and driving device of claim 4,  
wherein a reference potential of the CML or ECL is an  
intermediate potential lower than a supply voltage  
15 VCC of the modulation signal generating unit.

20 7. The laser modulating and driving device of claim 4,  
wherein the small swing differential signal output  
circuit further includes swing reducing means  
arranged before the CML or ECL to decrease the swing  
of the non-inverted and inverted signals input to the  
25 CML or ECL.

5     8. The laser modulating and driving device of claim 2,  
      wherein the small swing differential signal output  
      circuit has a first supply voltage, and the small  
      swing differential signal input circuit has a second  
10    supply voltage different from the first supply  
      voltage.

15    9. The laser modulating and driving device of claim 2,  
      wherein the small swing differential signal input  
      circuit has a differential signaling circuit using  
      transistors.

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      10. The laser modulating and driving device of claim  
      1, further comprising:  
25        a signal transmission line configured to connect

the modulation signal generating unit and the driving unit, through which said pair of small swing differential signals propagate; and

5 a first resistor that terminates said pair of small swing differential signals at an output end of the signal transmission line.

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11. The laser modulating and driving device of claim 10, further comprising:

15 a second resistor connected parallel to the first resistor and arranged at an input end of the signal transmission line to couple said pair of small swing differential signals.

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12. The laser modulating and driving device of claim 1, wherein the modulation signal generating unit and the driving unit are formed as spatially separated blocks, the laser modulating and driving device  
25 further comprising:

a signal transmission line for connecting the blocks to transmit the laser modulation signal from the modulation signal generating unit to the driving unit.

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13. The laser modulating and driving device of claim 10 12, further comprising:

a pixel data generating unit configured to supply the pixel data to the modulation signal generating unit, wherein the pixel data generating unit and the modulation signal generating unit are formed on the 15 same board.

20 14. The laser modulating and driving device of claim 12, further comprising:

a pixel data generating unit configured to supply the pixel data to the modulation signal generating unit, wherein the pixel data generating unit and the 25 modulation signal generating unit are formed as a

single integrated circuit.

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15. The laser modulating and driving device of claim  
1, wherein the modulation signal generating unit has  
an output-stage inverter or buffer having a supply  
terminal, to which a first voltage lower than a  
10 supply voltage of the modulation signal generating  
unit is applied.

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16. The laser modulating and driving device of claim  
1, wherein the modulation signal generating unit has  
an output-stage inverter or buffer having a ground  
terminal, to which a second voltage higher than a  
20 ground voltage is applied.

25 17. The laser modulating and driving device of claim

1, wherein the modulation signal generating unit has  
an output-stage inverter or buffer having a supply  
terminal, to which a first voltage lower than a  
supply voltage of the modulation signal generating  
5 unit is applied, and a ground terminal, to which a  
second voltage higher than a ground voltage is  
applied.

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18. The laser modulating and driving device of claim  
1, wherein the modulation signal generating unit has  
an output-stage inverter or buffer using a transistor,  
15 and wherein at least one of a high potential and a  
low potential that defines the a swing of said pair  
of small swing differential signals is generated by  
an ON resistance of the transistor.

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19. The laser modulating and driving device of claim  
1, wherein the modulation signal generating unit has  
25 an output-stage inverter or buffer and a resistor



connected in series with the output-stage inverter or buffer to reduce a swing of an output of the output-stage inverter or buffer.

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20. The laser modulating and driving device of claim 1, wherein the modulation signal generating unit is  
10 formed in a block spatially separated from the driving unit, and has an output-stage inverter or buffer and a resistor arranged outside the block to reduce a swing of an output of the output-stage inverter or buffer.

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21. The laser modulating and driving device of claim 20  
20 1, wherein the modulation signal generating unit has an output-stage inverter or buffer and a resistor connected to an output from the output-stage inverter of buffer to reduce a swing of the output from the output-stage inverter or buffer, and the driving unit  
25 has an input-stage differential signaling circuit

using a transistor.

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22. The laser modulating and driving device of claim  
1, wherein the modulation signal generating unit has  
a first supply voltage, and the driving unit has a  
second supply voltage higher than the first supply  
10 voltage.

15 23. A laser modulating and driving device comprising:  
a pixel data generating unit configured to  
produce pixel data and formed in a first block;  
a modulation signal generating unit configured to  
generate a laser modulation signal from the pixel  
20 data and formed in the first block together with the  
pixel data generating unit;  
a driving unit configured to drive a laser  
according to the laser modulation signal supplied  
from the modulation signal generating unit and formed  
25 in a second block spatially separate from the first

block; and

a signal transmission line connecting between the first block and the second block and transmitting the laser modulation signal.

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24. The laser modulating and driving device of claim 10 23, wherein the first block and the second block are independent printed circuit boards (PCB) or application specific integrated circuits (ASIC).

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25. The laser modulating and driving device of claim 23, wherein the modulation signal generating unit has a small swing differential signal output circuit 20 configured to output a pair of small swing differential signals as the laser modulation signal, the driving unit has a small swing differential signal input circuit configured to receive said pair of small swing differential signals, and the signal 25 transmission line is configured to transmit said pair

of small swing differential signals.

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26. The laser modulating and driving device of claim  
25, wherein the small swing differential signal  
output circuit has an output-stage circuit configured  
by a first logic, and the small swing differential  
10 signal input circuit is configured by a second logic  
different from the first logic.

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27. The laser modulating and driving device of claim  
26, wherein the first logic is current mode logic or  
emitter coupled logic.

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28. The laser modulating and driving device of claim  
26, wherein the second logic is differential  
25 signaling using a pair of transistors.

5 29. The laser modulating and driving device of claim  
25, wherein the small swing differential signal  
output circuit has a first supply voltage, and the  
small swing differential signal input circuit has a  
second supply voltage different from the first supply  
10 voltage.

15 30. An image reproducing apparatus comprising:  
a photosensitive unit;  
a light source using a laser;  
a laser modulation signal generating unit formed  
in a first block and configured to produce a laser  
20 modulation signal consisting of a pair of small swing  
differential signals based on pixel data;  
a driving unit formed in a second block spatially  
separated from the first block and configured to  
drive the laser according to the laser modulation  
25 signal;

a signal transmission line connecting between the first block and the second block for transmitting the laser modulation signal to the driving unit; and

5 a deflecting optical system for guiding and deflecting a laser beam emitted from the light source onto the photosensitive unit to form a latent image thereon.

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31. The image reproducing apparatus of claim 30, wherein the first block and the second block are formed as independent printed circuit boards (PCB) or  
15 application specific integrated circuits (ASIC).